

DETAILED ACTION

Election/Restrictions

Applicant's election of Species B, D, E and G in the reply filed on April 4, 2008 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)). Claims 9, 11, 21, 23 and 27 have been withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected species, there being no allowable generic or linking claim. See the attached Interview Summary regarding withdrawn claim 21.

Claim Objections

Claim 1 is objected to because of the following informalities: At line 7 of claim 1 the claim recites "pressure is at a applied temperature". The recitation should be - -pressure is at an applied temperature - - or - - pressure is applied at a temperature - - . Appropriate correction is required. Claim 5 is objected to because of the following informalities: The word "centimeter" is misspelled at line 2 of the claim. Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-4, 15, 22, 24, 26 and 32 are rejected under 35 U.S.C. 102(b) as being anticipated by Yamamoto et al. (JP 2000-167827).

Regarding claims 1 and 32, Yamamoto et al. disclose a method of producing polyphenylene ether (PPE) tablets comprising placing unheated PPE powder in a compression mold and subjecting the unheated powder to a pressure of 1 and 3 tons/cm² with a hydraulic compression machine wherein the pressure is applied to the powder while it is at room temperature/25 °C. (paragraphs [0016; 0023; 0026; and 0027]). The density increases from an initial value of 0.527 g/cc to 0.879 g/cc at 1 ton/cm² and from an initial value of 0.527 g/cc to 0.894 g/cc at 3 tons/cm² (paragraphs [0023; 0026; and 0027]). The examiner notes that polyphenylene ether is a specific poly(arylene ether) and that the polyphenylene ether employed by Yamamoto et al., namely poly(2,6,-dimethyl-1,4-phenylene) ether, is substantially similar to the PPE employed, also at 25 °C, in Examples 1-6 in the instant disclosure (i.e. the temperature of compression in Yamamoto et al. is below the glass transition temperature of the PPE). Further, the examiner notes that the glass transition temperature of PPE is over 200 °C.

As to claim 2, Yamamoto et al. disclose 1 and 3 tons/cm²; a temperature of 25 °C and a compressing time of 10 seconds (paragraphs [0023; 0026; 0027]).

As to claim 3, Yamamoto et al. produce an article having a compressive strength of 8.65 kilograms (paragraph [0027]).

As to claim 4, the density achieved by the compression in comparative examples 1 and 2 of Yamamoto et al. is 0.879 g/cc and 0.894 g/cc, respectively, (paragraph [0025] for units; and paragraphs [0026 and 0027]).

As to claim 15, Yamamoto et al. disclose an unheated mold upon introduction of the powder (paragraph [0026]).

As to claim 22, the compressed powder in tabular form set forth by Yamatomo et al. is understood to be a single phase compact (paragraphs [0026 and 0027]).

As to claim 24, the PPE powder disclosed by Yamamoto et al. has 60% of the particles with a size of less than 100 micrometers.

As to claim 26, Yamamoto et al. employ a confined pressure device (e.g. a mold with a piston and hydraulic compression that allows for an increase in pressure in the mold) (paragraph [0023]).

Claims 1, 8, 10, 12-15, 25, 26, 28 and 32 are rejected under 35 U.S.C. 102(b) as being anticipated by Umetsu et al. (WO 2002/094529).

The examiner notes that citations from WO 2002/094529 are taken from the US equivalent patent document US 2005/0098916.

Regarding claims 1 and 32, Umetsu et al. teach a method of producing tablets from thermoplastic resin powder and filler by compression molding the resin and the filler into tablets (Abstract). Umetsu et al. teach the thermoplastic resin powder may be formed by grinding room temperature or frozen pellets of material (paragraph [0074]) followed by tableting the thermoplastic powder and filler at room temperature (paragraphs [0072; 0115; 0118] and claim 24). Umetsu et al. teach that polyphenylene oxide is a preferred thermoplastic material (paragraph [0039]) for the tableting process. The examiner notes that the term polyphenylene oxide (PPO) is a synonym for the term polyphenylene ether (PPE) and that PPO/PPE is a specific type of poly(arylene ether). Further, the examiner notes that the glass transition temperature of polyphenylene oxide is well above room temperature, namely, above 200 °C. The filler employed by Umetsu et al. has a specific gravity as high as 3.5 (paragraph [0082]). Further, Umetsu et al. teach the resin and the filler may be blended together and then ground into a powder prior to utilizing pressure/compression molding to form the tablet from the mixture

(paragraph [0073]). Accordingly, it follows that the density of the final product will be higher than the density of the uncompressed resin powder.

As to claims 8, 10 and 12, Umetsu et al. employ materials such as ethylene vinyl acetate coated upon glass fibers (paragraphs [0041-0044]) which is amorphous. Ethylene vinyl acetate is a non-reactive binder as set forth in the original disclosure and has a glass transition temperature lower than PPE. Further, Umetsu et al. disclose substances (called substance X by Umetsu et al.) that facilitate shape retention (paragraph [0046-0050]), including wax (paragraph [0103]), which are also reasonably interpreted to be binders. These materials convert from a solid to a liquid at temperatures as low as 25 °C which is lower than the glass transition temperature of the PPE. Additionally, Umetsu et al. disclose mixtures of resins that can also include polystyrene (paragraph [0014 and 0039]).

As to claim 13, Umetsu et al. disclose mold release agents, pigments, flame retardants, antistatic agents and antioxidants (paragraph [0071]).

As to claim 14, Umetsu et al. teach the substance X may be employed from 0.1 to 30 parts by weight (paragraph [0051]) relative to 100 parts by weight of the total of resin and filler.

As to claim 15, Umetsu et al. teach the tabletting is done at room temperature (paragraphs [0115 and 0118]).

As to claim 25, Umetsu et al. employ powders with an average particle size of less than 1000 micrometers (paragraph [0074]).

As to claim 26, Umetsu et al. employ press-molding means to compression mold the tablets (paragraphs [0072] and [0115]) at a pressure of 5 MPa.

Regarding claim 28, Umetsu et al. teach a method of producing tablets from thermoplastic resin powder and filler by compression molding the resin and the filler into tablets (Abstract). Umetsu et al. teach the thermoplastic resin powder may be formed by grinding room

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temperature or frozen pellets of material (paragraph [0074]) followed by tableting the thermoplastic powder and filler at room temperature (paragraphs [0115 and 0118]). Umetsu et al. teach that polyphenylene oxide is a preferred thermoplastic material (paragraph [0039]) for the tableting process. Additionally, Umetsu et al. teach the filler may be coated with ethylene vinyl acetate (paragraph [0044]) which is a binder and also teach employing substances (referred to as Substance X by Umetsu et al.), such as wax (paragraphs [0046-0050] and [0103]), which facilitate shape retention of the tablet and are also reasonably interpreted to be binders. The examiner notes that the term polyphenylene oxide (PPO) is a synonym for the term polyphenylene ether (PPE) and that PPO/PPE is a specific type of poly(arylene ether). Further, the examiner notes that the glass transition temperature of polyphenylene oxide is well above room temperature, namely, above 200 °C. The filler employed by Umetsu et al. has a specific gravity as high as 3.5 (paragraph [0082]). Further, Umetsu et al. teach the resin and the filler may be blended together and then ground into a powder prior to utilizing pressure/compression molding to form the tablet from the mixture (paragraph [0073]). Accordingly, it follows that the density of the final product will be higher than the density of the uncompressed resin powder.

Claims 28 and 30 are rejected under 35 U.S.C. 102(b) as being anticipated by Fox (US 3,356,761).

Regarding claim 28, Fox teaches a method for forming melt processable polyphenylene ether (PPE) wherein polyphenylene ether powder and a liquid polymerizable material, such as styrene, (Example 1) are mixed together and compacted between two sheets of material (col. 4, lines 1-30) or cold-pressed (col. 5, lines 45-55) or press-cured at a temperature below the glass transition temperature of polyphenylene ether (col. 5, lines 35-43). The examiner submits all of

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these are reasonably understood to be compaction equipment comprising a compression mold as set forth in the instant disclosure. The liquid polymerizable material is a binder for the polyphenylene powder. Further, the examiner notes that the glass transition temperature of PPE is greater than 200 °C. Additionally, intrinsic to the compression operation is an increase in density of the article produced relative to the starting powder.

As to claim 30, Fox teaches the liquid binder can be heated/devolatized prior to the mixture being press cured (col. 5, lines 35-42) and also teach the mixture may be dissolved in a common solvent and evaporated (col. 3, lines 21-24) to form the material that will ultimately be processed.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 1-4, 15-20, 22, 24 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al. (JP 2000-167827) in view of Oliver et al. (US 5,767,426)

and Koslow (US 5,147,722). *Note: this is an alternative rejection based on the Yamamoto et al. reference.*

Regarding claim 1, Yamamoto et al. teach a method of producing polyphenylene ether (PPE) tablets comprising heating polyphenylene ether powder during manufacture between 70 °C and 200 °C (Abstract; paragraph [0019]) and compression molding the powder at a pressure of 0.1 to 5.0 tons/cm² (paragraphs [0016 and 0019]). The temperatures employed by Yamamoto et al. are less than the glass transition temperature of PPE, which is above 200 °C, and the density of the final product is higher than the density of the starting powder (paragraph [0023]). Yamamoto et al. exemplify feeding preheated powder into a preheated mold (paragraph [0023]). While Yamamoto et al. do suggest that the elevated temperature is only required “during manufacture” (paragraph [0019]), Yamamoto et al. do not expressly teach feeding the powder to the mold in an unheated state and then heating it to the required temperature for compression molding.

However, Oliver et al. teach that in compression molding powder based compositions which include a thermoplastic resin the composition can be preheated or the mold/die can be preheated or any combination of heating can be effectively employed (col. 7, lines 61-64) and Koslow teach that in compression molding powder based compositions which include a thermoplastic resin the exact procedure can be determined based on the size and shape of the product and can include pouring the powder into a heated mold and heating the mold again after the powder has been added (col. 18, line 58-col. 19, line 6).

Therefore it would have been *prima facie* obvious to one having ordinary skill in the art at the time of the claimed invention to have modified the method of Yamamoto et al. and to have fed the powder to the mold in an unheated state, followed by heating the powder after it was introduced into the mold, as suggested by Oliver and Koslow, since Oliver and Koslow both

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suggest that such heating variations are art recognized equivalent and alternative means of heating powder that is to be compression molded. Further, Koslow suggests the required heating would have been readily determined based upon the size and shape of the desired product. Further still, the examiner submits that it has been held that the sequence of performing process steps is *prima facie* obvious absent a showing of new or unexpected results (MPEP 2144.04 IV C).

As to claim 2, Yamamoto et al. teach a pressure 0.1 to 5 tons/cm²; a temperature of 70 °C to 200 °C; and exemplify a compressing time of 10 seconds (paragraphs [0016; 0019; 0023]).

As to claim 3, Yamamoto et al. produce articles having a compressive strength of 8.65, 16.5, 24.7, 30.9 and 104.7 kilograms (paragraphs [0023; 0024; 0027]).

As to claim 4, Yamamoto et al. teach the compressed material has a density from 0.7 to 1.5 g/cc (Abstract; paragraph [0023]).

As to claim 15, Yamamoto et al. disclose an unheated mold upon introduction of the powder in the comparative examples (paragraph [0026]). Further, as set forth above in claim 1, Koslow and Oliver teach that preheating or not preheating the powder and/or mold/die can be readily selected as equivalent alternative methods.

As to claims 16-20, Koslow teach that in compression molding powder based compositions which include a thermoplastic resin the exact procedure can be determined based on the size and shape of the product and can include pouring the powder into a heated mold, heating the mold again after the powder has been added. Additionally, Koslow teach that during heating no pressure is applied and no effort is made to consolidate the powder during the heating, that the powder must be at the desired temperature before the pressure is applied, and that the pressure must be applied rapidly thereby, suggesting the external supply of heat is

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stopped during the application of pressure (col. 18, line 58-col. 19, line 6). Further, Oliver et al. teach that in compression molding powder based compositions which include a thermoplastic resin the composition can be preheated or the mold/die can be preheated or any combination of heating can be effectively employed (col. 7, lines 61-64). The motivation to employ the teaching of Oliver et al. and Koslow in the method of Yamamoto et al. is the same as that set forth above in the rejection of claim 1.

As to claim 22, the compressed powder in tabular form set forth by Yamatomo et al. is understood to be a single phase compact (paragraphs [0023]).

As to claim 24, the PPE powder disclosed by Yamatomo et al. has 60% of the particles with a size of less than 100 micrometers.

As to claim 26, Yamatomo et al. employ a confined pressure device (e.g. a mold with a piston and hydraulic compression that allows for an increase in pressure in the mold) (paragraph [0023]).

Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al. (JP 2000-167827) in view of Oliver et al. (US 5,767,426) and Koslow (US 5,147,722), as applied to claims 1-4, 15-20, 22, 24 and 26 above, and further in view of Modern Plastics Handbook, edited by Charles A. Harper, Knovel release date: November 20, 2002.

As to claim 5, the combination teaches the method set forth above. Additionally, Yamamoto et al. teach the temperature ranges from 70 °C up to 200 °C which is immediately below the transition temperature and would thereby soften the PPE as set forth in the claim. Yamamoto et al. also teach the pressure ranges from 0.1 to 5.0 tons/cm². Yamamoto et al. also disclose a range of suitable densities from 0.7 to 1.5 g/cc and a range of sizes of materials to be molded (paragraph [0017] and [0020]). Yamamoto et al. do not expressly teach applying the

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pressure for 300 to 2000 seconds. However, Modern Plastics Handbook discloses that the overall cycle times required for compression molding is determined based upon the molding material, the thickness/size of the part to be produced and the mold temperature (6.2.3, last full paragraph).

Therefore it would have been *prima facie* obvious to one having ordinary skill in the art at the time of the claimed invention to have combined the teaching of Yamamoto et al. and Modern Plastics Handbook and to have optimized the required compression cycle time, including to times set forth in the claim, in order to achieve a compression molded product having the required density and size.

As to claim 6, Yamamoto et al. employ the same claimed starting material and disclose densities as high as 1.5 g/cc. Further, the combination set forth above suggests the same claimed process steps performed in the same claimed manner. Accordingly, the same claimed effects and physical properties (e.g. compressive strength) would intrinsically be achieved by the practice of the combined method.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto et al. (JP 2000-167827) in view of Oliver et al. (US 5,767,426) and Koslow (US 5,147,722) and Modern Plastics Handbook, edited by Charles A. Harper, Knovel release date: November 20, 2002, as applied to claims 5 and 6 above, and further in view of Weiss et al. (US 5,294,667).

As to claim 7, the combination teaches the method set forth above. Yamamoto et al. do not expressly state the material is processed to remove or reduce gas trapped between the particles. However, Weiss et al. teach that compaction/compression molding of polyphenylene ether removes the air contained in the interstices of the loose powder which in turn reduces the proportion of fines and the risk of dust explosions (col. 2, lines 55-67).

Therefore it would have been *prima facie* obvious to one having ordinary skill in the art at the time of the claimed invention to have combined the teaching of Yamamoto et al. and Weiss et al. and to have removed entrained air from the interstices of the loose powder in the method of Yamamoto et al. since Weiss et al. teach that compaction/compression molding intrinsically performs this function and the result is a product that has reduced fines and reduced risk of dust explosions.

Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Umetsu et al (WO 2002/094529), as applied to claims 1, 8, 10, 12-15, 25, 26, 28 and 32 above, and further in view of Nitzsche et al. (US 2002/0198123).

As to claim 29, Umetsu et al. teach the method of claim 28 as set forth above. Umetsu et al. disclose the composition includes fillers, a substance X which can also include foaming agents, a wax binder, and liquid organic compounds (paragraphs [0046; 0053; 0103]). Umetsu et al. do not teach heating the binder prior to blending with the thermoplastic resin. However, Nitzsche et al. teach a method of forming a composition that includes fillers, wax binders, foaming agents and liquids that are heated and then pelletized to form a composition that is subsequently blended with a thermoplastic resin (paragraphs [0014-0017 and 0029-0031]).

Therefore it would have been *prima facie* obvious to one having ordinary skill in the art at the time of the claimed invention to have modified the method of Umetsu et al. and to have heated the binder prior to blending with the thermoplastic resin, as suggested by Nitzsche et al., for the purpose of reducing the number of individual raw material components that needed to be individually added to the thermoplastic resin of Umetsu et al.

Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Umetsu et al (WO 2002/094529), as applied to claims 1, 8, 10, 12-15, 25, 26, 28 and 32 above, and further in view of Yamamoto et al. (JP 2000-167827).

As to claim 31, Umetsu et al. teach the method of claim 28 as set forth above. Further, Umetsu et al. teach the powders have an average particle size of less than 1000 micrometers, preferably less than 500 micrometers (paragraph [0074]). Umetsu et al. do not teach that the powder comprises about 5 to about 70 percent of particles having a particle size less than 100 micrometers. However, Yamamoto et al. teach a compression molding process wherein 60 percent of the particles have a size of less than 100 micrometers (paragraph [0023]).

Therefore it would have been *prima facie* obvious to one having ordinary skill in the art at the time of the claimed invention to have employed the PPE disclosed by Yamamoto et al. in the method of Umetsu et al. since Yamamoto et al. teach such a PPE is suitable for analogous compression molding applications.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: US 4,492,805 to Besecke et al. discloses the glass transition temperature of poly(arylene ethers) ranges from 100 °C to 300 °C (col. 1, lines 5-10) and US 6,194,518 to Singh et al. discloses polyphenylene ether has a glass transition temperature of around 210 °C (col. 4, line 58).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JEFFREY WOLLSCHLAGER whose telephone number is (571)272-8937. The examiner can normally be reached on Monday - Thursday 6:45 - 4:15, alternating Fridays.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Christina Johnson can be reached on 571-272-1176. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jeff Wollschlager/
Examiner, Art Unit 1791

July 8, 2008